

A METHOD OF PREVENTING SURFACE ROUGHENING DURING HYDROGEN PRE-BAKE OF SIGE SUBSTRATES USING CHLORINE CONTAINING GASES

ABSTRACT

The invention forms an epitaxial silicon-containing layer on a silicon germanium, patterned strained silicon, or patterned thin silicon-on-insulator surface and avoids creating a rough surface upon which the epitaxial silicon-containing layer is grown. In order to avoid creating the rough surface, the invention first performs a hydrofluoric acid etching process on the silicon germanium, patterned strained silicon, or patterned thin silicon-on-insulator surface. This etching process removes most of oxide from the surface, and leaves only a sub-monolayer of oxygen (typically $1 \times 10^{13} - 1 \times 10^{15}/\text{cm}^2$ of oxygen) at the silicon germanium, patterned strained silicon, or patterned thin silicon-on-insulator surface. The invention then performs a hydrogen pre-bake process in a chlorine containing environment which heats the silicon germanium, strained silicon, or thin silicon-on-insulator surface sufficiently to remove the remaining oxygen from the surface. By introducing a small amount of chlorine containing gases, the heating processes avoid changing the roughness of the silicon germanium, patterned strained silicon, or patterned thin silicon-on-insulator surface. Then the process of epitaxially growing the epitaxial silicon-containing layer on the silicon germanium, patterned strained silicon, or patterned silicon-on-insulator surface is performed.